<Contributed Talk 8>Partial control of noisy chaotic transients using escape times

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When we attempt to control a linear system in which some noise has been added, typically we need a control higher or equal to the amount of noise added. When we have a region in phase space where there is a chaotic saddle, all initial conditions will escape from it after a transient with the exception of a set of points of zero Lebesgue measure. The action of an external noise makes all trajectories escape even faster. Attempting to avoid those escapes by applying a control smaller than noise seems to be an impossible task. Here we show, however, that this goal is indeed possible, based on a geometrical property found typically in this situation: the existence of a horseshoe. The horseshoe implies that there exists what we call safe sets, which assures that there is a general strategy that allows one to keep trajectories inside that region with a control smaller than noise. We call this type of control partial control of chaos [1,2] that allows one to keep the trajectories of a dynamical system close to the saddle even in presence of a noise stronger than the applied control. In this talk recent progress and new results [3] on this control strategy by using information obtained from the escape times are presented. This is joint work with James A Yorke (USA), Samuel Zambrano and Juan Sabuco (Spain).

[1] Samuel Zambrano, Miguel A. F. Sanjuán, and James A. Yorke. Partial Control of Chaotic Systems. Phys. Rev. E **77**, 055201(R) (2008).

[2] Samuel Zambrano and Miguel A. F. Sanjuán. Exploring Partial Control of Chaotic Systems. Phys. Rev. E **79**, 026217 (2009).

[3] Juan Sabuco, Samuel Zambrano, and Miguel A. F. Sanjuán. Partial control of chaotic transients and escape times. New J. Phys. 12, 113038 (2010).